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A study on developing "Basic Computer Use Performance Scale (BCUPS)" for Primary Students [a]

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Abstract

Aim of computer courses in primary education is to teach information technology use skills in the light of modern technological developments in Turkey. From this point, the aim of study is develop a scale to uncover of primary students' basic computer use performances. In order to develop a scale, explanatory and confirmatory factor analysis were conducted with a sample of 835 primary students. According to explanatory factor analysis (EFA) results BCUPS was developed that has 53 items under seven subscales. As a result of confirmatory factor analysis, RMSEA value was found at 0.046. The Cronbach-Alpha internal integrity coefficient of the final version of the BCUPS was found at 0.971. The results of the two analysis illustrated that BCUPS is a valid and reliable scale for measuring basic computer performance.

Keywords: Basic computer use, performance indicators, primary students

1. Introduction

People in information society can seek, reach, classify, store and assess information in all aspects, For this, in developing and changing social order individuals tend to value to information, know how to access information and produce using accessed information. The most important features of individuals in information society are can use information technology effectively based on a computer and benefit from them effectively in meeting their needs. Individuals should gain this feature to becoming a member of information society. Education process is an important factor for gaining individuals any technological developments and skills related with computer in information societies. Many countries trying to understand developments in information technology and also they start to adapt these developments into their curriculum to teach basic concepts and usage skills. For this aim, educational steps have a great importance to teach new generation as a member of information society. One of these important steps is primary education.

Computer course instructional program in primary education focuses on teaching basic computer skills in information technology for primary students. In this computer courses program related to gaining computer technology usage skills have a great importance. The aim of computer lessons in primary education is gaining information technology usage culture in the light of modern technological developments (MEB, 2006). Computers have become one of the main technological tools in our daily life. Computers; allow students to learn according to

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their own learning speed, gain more permanent learning outcomes compared to other educational environments and realizes learning more effectively by providing software, animations, pictures and videos. In order live in the complex world of future, all people should have the ability to use and take advantages of this technology. It is the main purpose to uncover students' basic computer usage skills by various facilities in the context of computer courses. As well as internet and computer security subjects other courses such as word, presentation and calculation software should be taught to primary students. These software become main applications due to their features they have a great importance in students' future education life.

Today employers state that, computer literacy will be gains more importance in 21th century (Anderson, Biksan & Mitchell, 1995). In terms of awareness and guidance it is very important for both people and future generation to learn basic computer skills and use them in modern life. It can be said that people are computer literate who have skills for; improve his life standards, access information, monitor and discuss computer related to innovations and compare technological developments (Yazıcı, 2006). But rapid developments and changes in computer technology shows that computer literacy must be required for life-long behavior. So computer literacy education must be taught from primary education and will be continue at the next stages of education with integrity. From this point, it can be achieved for primary and secondary students to participate with fully computerized knowledge in their future lives by investigating basic computer performances in early years. In literature, it can be seen some studies related to investigating computer course curriculum in elementary education (Çakmak, 2001; Öztopçu, 2003; Tekerek, 2007; Kural & Güven, 2008) and attempting to uncover computer literacy levels of primary school students (Kıncal & Ulutaş, 2009) in Turkey. But there wasn't seen any instrument to determine students' computer use performances at which level. By applying a performance scale to primary and secondary students after computer courses it can be easily investigated their learning outcomes. From this point it is aimed to develop a scale to uncover primary and secondary students' basic computer use performances.

2. Methodology

The purpose of the present study is to develop a valid and reliable instrument to be used for measuring primary students' basic computer use skills. This research was carried out in fall semester of 2011 at a small country in northeastern Turkey. Survey methodology was used in this study. Sample of this study consist of 835 primary students at varied grades at a small city in north-eastern Turkey. The sample of the research consists of 448 (53.7%) male and 387 (46.3%) female student. Looking at these students grades; 124 (14.9%) of students were in 4th grade, 220 (26.3%) were 5th grade, 151 (18.1%) of them were 6th grade, 210 (25.1%) of them were 7th grade and 130 (15.6%) of them were 8th grade.

2.1. Development process of basic computer use performance scale(BCUPS)

In the development process of BCUPS five steps were carried out. In the first step, many scales towards computer self-efficacy (Akkoyunlu, Orhan & Umay, 2005; Köseoğlu, Yılmaz, Gerçek & Soran, 2007; Yeşilyurt & Gül, 2007) and computer literacy (Tor & Erden, 2004; Sönmez, 2005; Kılınç & Salman, 2006; Gülbahar & Güven, 2008; Uzun, 2008) were examined to determine statements of BCUPS. In the second step, an item pool was developed from the reviewed literature in step one which consist of 58 statements. After deciding on the items, an initial item pool was generated and 56 item were put on a three-point Likert type rating scale using classifications like "Yes", "Neutral" and "No". In the third step, an initial draft items were given to relevant three experts in the fields of computer education, measurement and assessment, Turkish education for formal review. The experts were asked to evaluate with regard to their relevance for areas as, content validity, clearness and understandability, accuracy and distracters. As a result of this expert reviews, numerous items were rewritten and three of them were eliminated. As a result of third step the BCUPS consists 53 items. In the fourth step, final version of BCUPS was administered to 835 primary and secondary students for calculating validity and reliability. In the fifth step, firstly, in order to examine the factor structure behind the attitude scale, the data was subjected to Exploratory Factor Analysis (EFA) using the principle component method via SPSS 13.0 statistical software.

Reliability analysis was performed for each of the emerged sub-scales, and the Croanbach alpha correlation coefficients were used. Then, the Croanbach alpha correlation coefficients were calculated among these factors. Secondly, in order to test the developed BCUPS's factor structure, Confirmatory Factor Analysis (CFA) was performed via LISREL software. To determine compliance of factor model, RMSEA value was revealed.

3. Findings

Before conducting the factor analysis of the scale, the Kaiser–Meyer Olkin (KMO) measurement of sampling adequacy (KMO) and Barlett's test were calculated to evaluate whether the sample was large enough perform to apply a satisfactory factor analysis and was examined to determine appropriateness of factor analysis. The KMO sampling adequacy test statistic was 0.974. This value is higher than the threshold value of 0.5 (Kline, 1994; George & Mallery 2001). Barlett's test of Spherincity statistic was significant [25682.822 ($p< 0.01$)]. Results of KMO and Barlett's test indicators allowed us to use factor analysis for the data appear to support the validity of the factor analysis usage for this study.

3.1. Exploratory factor analysis (EFA)

The objective of the EFA is to find the number of separate components that might exist for a group of items. An additional purpose of the exploratory factor analysis was to investigate the factors underlying the BCUPS in this study. The analysis of the data obtained from this larger study began by examining the dimensions obtained from the factor analysis of the data. So, the exploratory factor analysis was performed on the 53 items. First of all, it a principle components factor analysis was used on all the data to extract the appropriate number of factors. Then, varimax rotation was performed. As a result of varimax rotation, loadings of less than 0.40, a commonly-used cut-off, were eliminated. Thus, the factor analysis resulted in seven independent factors with factor loadings greater than 0.4. Factor structures with their loadings were shown in Table-1.

As seen Table 1, there are seven factors in BCUPS. Eigenvalues of the factors are; 7.763, 5.640, 5.421, 4.129, 3.507, 2.702 and 1.791. Factor 1 explained 14.647%, factor 2 explained 10.642%, factor 3 explained 10.228%, factor 4 explained 7.790%, factor 5 explained 6.617%, factor 6 explained 5.098% and factor 7 explained 3.380% of total variance. These seven factors explained 58.402% of total variance and were named according to the common characteristics of the items loaded on the same factor. According to Table 1, factor 1 includes nine items: 1, 2, 3, 4, 5, 6, 7, 8 and 9. These items explicitly measures students' entry-level skills and this factor named as "entry-level skills (ELS)". Factor 2 includes twelve items: 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20 and 21. These items explicitly measures students' skills to use Windows operation system and this factor named as "skills to use operation system (SUOP)". Factor 3 includes twelve items: 22, 23, 24, 25, 26, 27, 28, 29, 30 and 31. These items explicitly measures students' skills to use word software and this factor named as "skills to use word (SUW)". Factor 4 includes seven items: 32, 33, 34, 35, 36, 37 and 38. These items explicitly measures students' skills to use excel software and this factor named as "skills to use excel (SUE)". Factor 5 includes six items: 39, 40, 41, 42, 43 and 44. These items explicitly measures students' skills to use powerpoint software and this factor named as "skills to use powerpoint (SUP)". Factor 6 includes six items: 45, 46, 47, 48, 49 and 50. These items explicitly measures students' skills to use internet and this factor named as "skills to use internet (SUI)". Factor 7 includes three items: 51, 52 and 53. These items explicitly measures students' skills to manage computer security problems and this factor named as "skills to manage security problems (SMCSP)".

Reliability analysis was performed for each factor, and croanbach alpha correlation coefficients were used. Then, the croanbach alpha correlation coefficients were calculated among these factors. It was determined that croanbach alpha value of ELS is 0.8582, SOUP is 0.8921, SUW is 0.912, SUE is 0.9237, SUP is 0.9062, SUI is 0.8387 and SMCSP is 0.7403. Also, croanbach alpha value of total scale (BCUPS) is 0.9705. According to these results BCUPS seen as a valid and reliable scale.

Table 1. Factor structures and loadings of the 53 items in BCUPS

No	Items	Fac 1	Fac 2	Fac 3	Fac 4	Fac 5	Fac 6	Fac 7
9	I can use a mouse.	.651						
7	I can place a CD and read information in it.	.627						
1	I can open and shut down computer.	.624						
4	I can store files in a floppy disc.	.556						
8	I can use keyboards keys.	.549						
6	I can burn a CD.	.549						
5	I can place a floppy disc and read information in it.	.500						
2	I have knowledge about what is the task of main hardware units (CPU, RAM, Motherboard etc.) in computer.	.473						
3	I can use additional units (scanner, printer etc.) of computer.	.463						
16	I can create a folder/file on the desktop.		.667					
19	I can cut a folder/file from desktop to other window.		.654					
14	I can create a shortcut on the desktop.		.642					
15	I can manage switching between windows, resize and move them.		.618					
18	I can copy a folder/file from desktop to other window.		.610					
17	I can rename a folder/file.		.569					
20	I can delete a folder/file on the desktop.		.565					
12	I can setup and remove a program.		.558					
13	I can manage icons on the desktop.		.546					
11	I can manage system properties (Time, date, resolution etc.).		.539					
10	I can use an operation system.		.512					
21	I can search and reach a folder/file.		.451					
23	I can select writings on the word document.			.693				
28	I can create a table on the word document.			.630				
25	I can format writings (font, colour, align etc.).			.624				
27	I can add page numbers.			.623				
22	I can start Word software.			.623				
26	I can add a Picture and Wordat objects on the word document.			.610				
24	I can copy, cut and delete selected writings.			.570				
31	I can print a word document.			.503				
29	I can create automatic shapes.			.501				
30	I can add a hyperlink.			.439				
34	I can enter variables in excel worksheet.				.735			
33	I can select cells in excel worksheet.				.734			
36	I can manage arithmetic formula in a worksheet.				.716			
37	I can manage functions in a worksheet.				.706			
35	I can format entered variables in a worksheet.				.665			
38	I can create graphics up to variables in a worksheet.				.663			
32	I can start Excel software.				.639			
41	I can add objects (Picture, text box, etc.)in a Powerpoint slide.					.663		
43	I can manage slide transition.					.612		
40	I can create a presentation in Powerpoint.					.612		
42	I can give effects to objects in a Powerpoint slide.					.598		
39	I can start Powerpoint software.					.554		
44	I can add a sound and video object in a Powerpoint slide.					.507		
46	I can surf through internet.						.633	
48	I can compose an e-mail.						.602	
45	I can start internet browser.						.592	
47	I can search through search engines.						.494	
49	I can reply an e-mail.						.493	
50	I can add an attachment to my e-mail.						.474	
51	I can block risks in computer.							.687
52	I can manage computer's security problems.							.626
53	I can use anti-virus software for possible virus attacks.							.610
	Eigen values	7.763	5.640	5.421	4.129	3.507	2.702	1.791
	% of variances	14.647	10.642	10.228	7.790	6.617	5.098	3.380
	Total variances				58.402			

3.2. Confirmatory factor analysis (CFA)

By performing EFA, the underlying factor structure is identified. In order to verify the factor structure of a set of observed variables, CFA should be performed. To determine the adequacy of tested model, a number of compliance values should be used. One of them is Root Mean Square Error of Approximation (RMSEA) is related to residual in the model. RMSEA value ranges from 0 to 1 with a smaller RMSEA value indicating better model fit. Acceptable model fit is indicated by RMSEA value is 0.05 or less (Brown, 2006). In terms of analysis results in this study, RMSEA value calculated as 0.046 and this shows the factor structure model is compatible.

4. Conclusion

Scope of this study, a scale has been developed to measure primary students' basic computer use performance skills. Course objectives carried out at what level has a great importance in primary education. From this point, a performance scale should be prepared in detecting encountered difficulties after discovering basic computer skills related with computer courses. By utilizing this scale it can be easily revealed in which topic students have deficiencies. The finding of this study has shown that reliability coefficient calculated by croanbach-alpha is 0.9705. Measurement tools that can be used in different kinds of researches for the prescribed level of reliability coefficient is 0.70 (Tezbaşaran, 1997) coefficient in this study seems high. It is believed the BCUPS will be filled the gap in the literature related to detect basic computer performance skills. Followed by the additional validation studies; the BCUPS will serve as a valuable tool for both instructors and researchers to assess students' basic computer skills.

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